# AMO REPORTS 82-18

## CANADIAN SHIELD DISPOSAL SITES AND NUCLEAR FUEL WASTE MANAGEMENT

THE ASSOCIATION OF MUNICIPALITIES OF ONTARIO
AUGUST 1982

## ASSOCIATION OF MUNICIPALITIES OF ONTARIO

The Association of Municipalities of Ontario, a non-partisan voluntary organization, is united to promote the values of the municipal government system and the status of the municipal level of government as a vital and essential component of the total intergovernmental framework of Ontario and Canada.

The Association acts as the collective voice of Ontario's municipal governments and is organized to accomplish through cooperation and coordination, what the majority have neither the time nor the resources to do individually.

The Association represents some six hundred (600) municipal governments throughout Ontario. The governing body is composed of some eighty (80) municipal elected and appointed officials, who in turn represent a wide-range of municipal government interest.

The following sections and affiliated municipal professional associations form an important part of the Association's structure and therefore, play an important part in its activities in terms of the Board of Directors, program and policy development:

**Association Sections.**

* County and Regional Section
* Large Urban Section
* Northern Ontario Section (FONOM/NOMA)
* Rural (ROMA) Section
* Organization of Small Urban Municipalities Section

**Association Affiliates.**

* Association of Municipal Clerks and Treasurers of Ontario
* Association of Municipal Tax Collectors of Ontario
* Municipal Engineers Association
* Ontario Municipal Administrators Association
* Ontario Municipal Personnel Association
* Ontario Municipal Social Services Association
* Society of Directors of Municipal Recreation of Ontario

To the Municipal Clerk:

Please circulate this Report to the members of council and to the staff of your municipality. Additional copies are available at $2.50 each from the Publications Centre, Association of Municipalities of Ontario, 100 University Avenue, Suite 902, Toronto, Ontario M5J 1V6

## TABLE OF CONTENTS


| | PAGE |
|---|---|
| INTRODUCTION | 1 |
| SOME MUNICIPAL CONCERNS | 1 |
| AECL NUCLEAR WASTE FUEL MANAGEMENT | 2 |
| The Need for Permanent Waste Storage | 2 |
| Current Storage | 2 |
| Waste Storage in Canadian Shield | 3 |
| Pre-closure and Post-closure Activities | 3 |
| Disposal Assessment | 3 |
| Regulatory Agencies | 3 |
| Transportation--Radioactive Fuel Waste | 4 |
| Socio-Economic Impact | 5 |
| Post-closure Phase--Assessment | 5 |
| Ground Water | 6 |
| Uncertain Analysis | 6 |
| RECOMMENDATIONS | 6 |



"AMO Reports 82-18" was prepared by the Small Urban (OSUM) Section of AMO, endorsed by the AMO Board of Directors, and submitted to the Honourable Keith Norton, Minister of the Environment, and the Honourable John Roberts, Minister of Science and Environment, on September 15, 1982.

# CANADIAN SHIELD DISPOSAL SITES AND NUCLEAR FUEL WASTE MANAGEMENT

## INTRODUCTION

This report consists of three parts. The first raises several considerations for Ontario's municipal politicians in general, and OSUM members in particular. In part two, a summary of intent and thrust of the Atomic Energy of Canada Limited Nuclear Fuel Waste Management studies is presented. Part three states four recommendations regarding the report.

The summary of AECL's three volume report is offered as a general background for local municipal leaders. No attempt is made to comment on the picture presented by AECL. Instead, the summary is intended to reflect faithfully the opinions and strategies presented in the Nuclear Fuel Waste Management reports. (TR-127-1)

## SOME MUNICIPAL CONCERNS

The AECL Report raises several concerns for Ontario's Municipalities.

1. The senior levels of government--Federal and Provincial--appear to be given complete discretion in the approval of the disposal recommendations.

2. Municipal input is suggested. However, it appears to be offered a very minor role in a question which holds major importance to municipalities.

3. Some 1,400 potential disposal sites have been identified on the Canadian Shield in Ontario. In addition to the AMO and OSUM member municipalities located on the Shield, many municipalities are located along potential transport routes.

4. Estimates of potential damages from movement of radioactive fuel "will be based on experience with irradiated fuel." Municipal experience with the transportation of toxic wastes has not been positive. In addition, the suggested number of shipments (6,042 per year) may complicate the safety question.

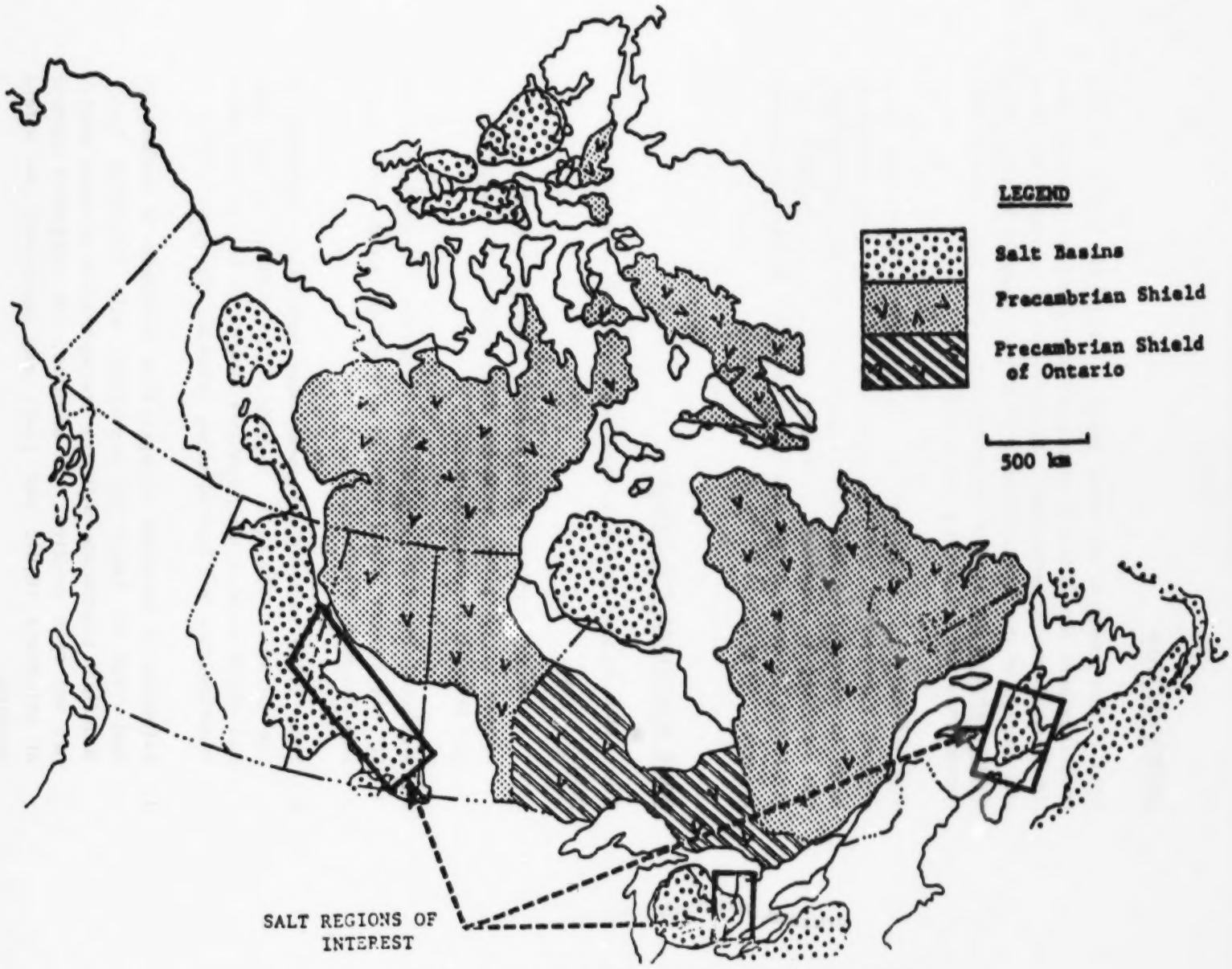


FIGURE 12: SOME GEOLOGIC FORMATIONS IN CANADA

5. The AECL uncertainty regarding the accuracy of its predictions for human safety during post-closure is not reassuring to potential target municipalities.

6. The social and economic impacts of such disposal programs can be significant. It appears that municipalities should be concerned about the methods AECL suggests will be used to determine such impacts.

7. The AECL statement that the procedures and methodologies for pre-closure assessment have now been established should raise several questions--especially since comment is invited after the fact.

## AECL NUCLEAR WASTE FUEL MANAGEMENT

### The Need for Permanent Waste Storage

Irradiated fuel from CANDU reactors is intensely radioactive. Fuel wastes give off radiation which is potentially harmful to living organisms. The overall goal of waste disposal is to minimize the actual hazard to an acceptable level.

### Current Storage

Currently, irradiated fuel is stored in water-filled pools at the reactor sites. This method of storage has proven safe and is considered reasonable for perhaps fifty years, but not for hundreds or thousands of years. Since radioactive material is potentially hazardous for thousands of years, it must be disposed of permanently. There must be no requirement for continuing maintenance and control.

The ideal would be to reduce the hazard to zero and leave no responsibility to future generations. However, since absolute safety cannot be guaranteed, there is a requirement to define "acceptable" levels of risk.

**Waste Storage in Canadian Shield**

Atomic Energy of Canada Limited (AECL) is engaged in a research and development program to deal with methods of disposing of nuclear fuel wastes. Investigation currently centers on deep, underground placement in selected Canadian Shield sites. About 1,400 potentially suitable site formations have been identified.

**Pre-closure and Post-closure Activities**

The processes affecting wastes are divided into two categories: 1) pre-closure--includes removing irradiated fuel from storage bays, transporting it to the disposal site, immobilizing the fuel bundles, placing them in a vault, and backfilling and sealing the vault. 2) post-closure--deals with the period after pre-closure.

Natural processes, rather than management by man, will determine what happens to the stored wastes.

**Disposal Assessment**

Specific criteria for the pre-closure phase is similar to those used in the approval and licensing of nuclear reactors. Post-closure has no such precedents. AECL is breaking new ground in this area.

**Regulatory Agencies**

The Atomic Energy Control Board (AECL) will be the lead agency for the regulations and the environmental review of the disposal concept. It will be assisted by the Federal Department of the Environment and the Ontario Ministry of the Environment. Together, the three agencies comprise the Interagency Review Committee.

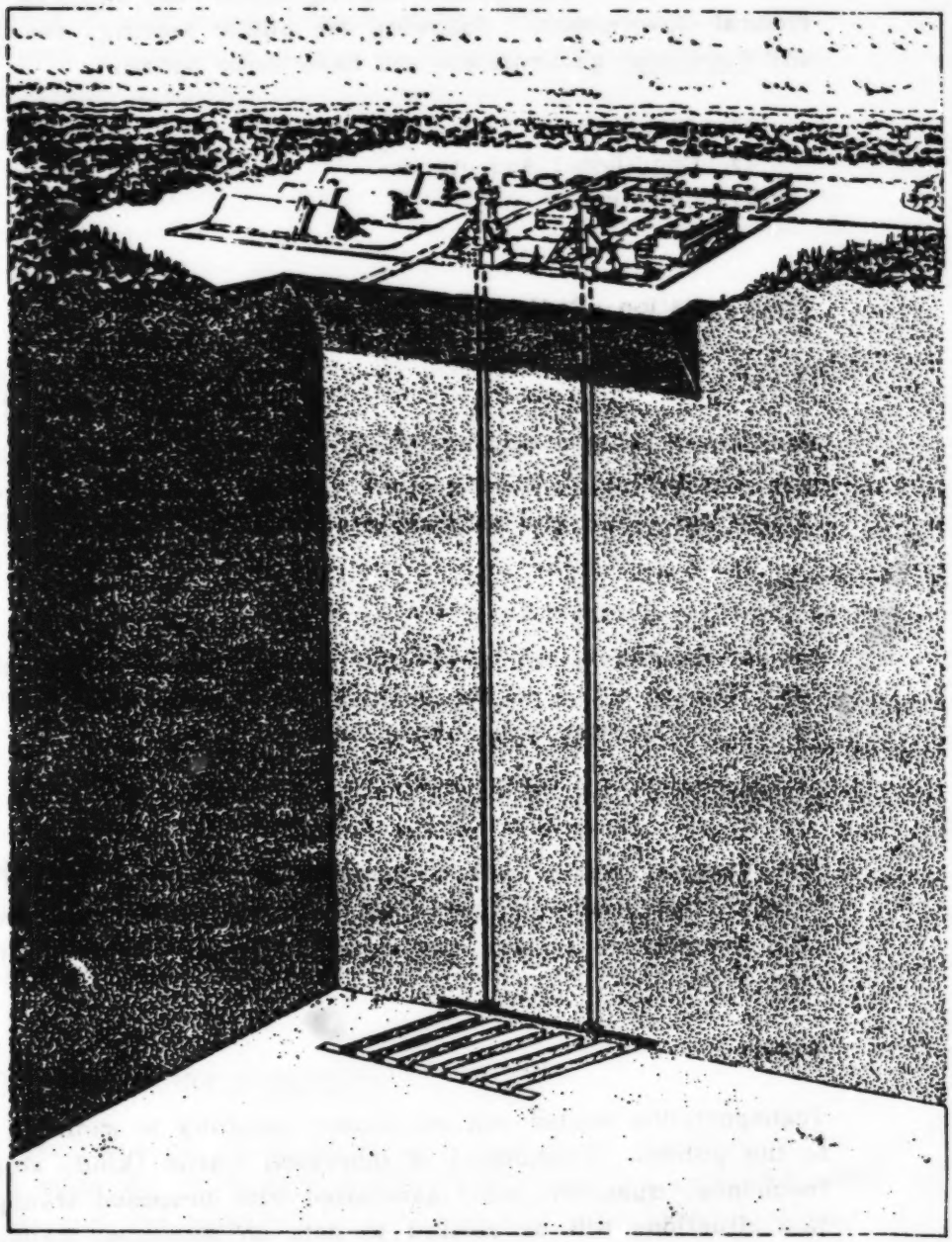


FIGURE 15: ARTIST'S RENDERING OF DEMONSTRATION FACILITY (CUT-AWAY VIEW)

When the regulatory review is completed in the late 1980's, there will be a full public hearing under the auspices of the Federal Government. Following the public hearing, the Federal and Provincial governments will have three options:

1) Acceptance;
2) Conditional Acceptance;
3) Rejection.

## Transportation--Radioactive Fuel Waste

### Method

Waste fuel bundles will be shipped by truck, train, or barge. The method will depend upon safety analysis, economics, reactor locations, and disposal site locations.

### Weight

Loaded fuel flasks will weigh about 40 Mg (44 tons) and hold 96 fuel bundles. One 40 Mg flask is the maximum load that could be carried by road transport in Ontario.

### Quantity

The disposal center will be capable of handling 580,000 fuel bundles per year. (Approximately 6,042 loaded fuel flasks). This quantity represents the anticipated fuel production to the year 2020.

### Routes

Transportation routes will be chosen carefully to minimize risks to the public. Predictions of increased traffic (kind, shipment frequency, duration, etc.) associated with proposed transportation situations will be related to data on municipal transportation and communications services. Public perceptions and concerns about transportation accidents will be addressed.

## Transit Risks

Estimates of risk during transportation will be based on experience with irradiated fuel and on Ontario and Canadian occupational fatality statistics for road and rail transport.

The safety assessment of the disposal center and transportation system will identify accidental occurrences that could lead to abnormal release of radiation. Consequences will be considered both for the workers and for the general public.

The procedures and methodology for pre-closure assessment have now been established and will be applied and improved upon during the next phase of development.

## Socio-Economic Impact

The estimation of the social and the economic impacts related to the disposal project will be based on Ontario Hydro's experience. In addition, selected studies are to be used to help identify major community impacts.

The analysis will consider the gradual buildup of impacts over time. It will involve identification of work-force requirements over time in terms of needed trades and skills. Estimates of local population changes will be based on a mathematical model ("POPIN" model). Potential conflicts with respect to objective factors (municipal services, etc. and more subjective factors (community lifestyles, etc.) will be identified.

## Post-closure Phase--Assessment

The post-closure phase of nuclear fuel waste management will start when the vault (like a mine shaft) has been backfilled and sealed and the surface facilities removed. Assessment of this phase concentrates on the evaluation of mechanisms by which radioactive waste can be transferred from the disposal vault into the biosphere (earth's life-zones--including plants and animals).

**Ground Water**

In AECL's opinion, the only waste escape which merits extensive study and analysis is the penetration of storage containers by ground water. The ground water may wash out radioactive materials and carry them to the surface.

**Uncertain Analysis**

Present analysis is not specific. Predicting risks arising from nuclear waste disposal is subject to several types of uncertainty: 1) the ability of models to describe real situations; 2) results which are not site specific; 3) for a particular site and design, physical characteristics are variable.

Finally, the assessment procedure incorporates a variety of natural processes to describe the movement of radioactivity to men based on a 50-year dose basis. This preliminary assessment estimates that maximum radiation doses are generally lower than natural background doses. However, AECL clearly stated that the agency is not yet fully confident of the accuracy of present models.

> Due to the preliminary nature of the models and data, we do not place strong confidence in these estimates. With better understanding of the various mechanisms and processes, and with the use of more realistic data, our confidence in the anlysis will increase.
>
> (Volume 3, pp. 91-93)

**RECOMMENDATIONS**

The following are the recommendations of the AMO Planning and Environment Committee:

1) That the Planning and Environment Committee concur with the municipal concerns outlined on page 1 of the report.

2) That the Inter-Association Working Group on the Transportation of Dangerous Goods re-convene to look at the issue of transporting nuclear fuel waste.

3) That by way of initiating dialogue among the Governments of Canada and Ontario, AECL and AMO:

   a) a letter be sent to the Honourable W.G. Davis, Premier of Ontario, requesting assistance in establishing dialogue with the Federal Government on the issue of nuclear fuel waste management.

   b) a letter be sent to the Honourable John Roberts, Minister of Environment Canada, indicating that nuclear fuel waste management is a municipal concern and request that some consultation take place with municipal representatives with respect to disposal site location and method of transporting nuclear fuel waste.

## PUBLICATIONS ISSUED IN THE "AMO REPORTS" SERIES

1. 1980 Guidelines for Municipal Bargaining
2. Assessment Review and Appeal Procedures
3. Response to the Children's Research Information Task Force Report
4. The Status of Public Swimming Pools in Ontario
5. Child Abuse
6. Response to Bill 127--An Act To Revise The Pits and Quarries Control Act, 1971
7. Response to the Provincial Announcement of 1980 Transfer Payments to Municipalities
8. Municipal Undertakings Under The Environment Assessment Act
9. Special Purpose Boards and Commissions
10. Motorized Off-Highway Vehicles
11. Foster Care
12. Public Libraries in the 1980's
13. Development of Treatment and/or Disposal Sites for Liquid Wastes and Hazardous Wastes
14. Group Homes
15. Conservation Authorities
16. Perpetual Care for Waste Management Facilities
17. Discussion Paper on Bill 74--An Act To Establish A Code Of Procedure for Provincial Offences
18. Occupier's Liability and Trespass To Property
19. Toward Property Tax Reform
20. The Draft Planning Act (Out-of-Print)
21. Child Welfare in Ontario: Past, Present and Future
22. The Parks Assistance Act
23. The Handling and Transportation of Dangerous Goods
24. Housing Rehabilitation Programs in Ontario
25. Residential Conversions in Ontario
26. Shelter Allowances
27. The Cemeteries Act
28. Proposed Policies: Coordinated Program Strategy for the Ministry of Natural Resources in Southern Ontario
29. Ontario Budget 1980: Implications for the Municipal Sector
30. Mortgage Interest Rates
31. Supplement to AMO's Response to the Draft Planning Act
32. Parkland Conveyance Standards
33. Boarding and Lodging Homes and Domiciliary Care Hostels
34. The General Welfare Assistance Act: Administration Costs
35. Social and Economic Criteria Used in Ontario Hydro's Site Selection Process
36. Equalization Factors and Apportionment in 1981
37. Flood Plain Management Policies
38. Provincial Roads Grants: Administrative Procedures
39. Public Swimming Pools--Ontario Regulation 792/77
40. Compulsory and Binding Arbitration
41. Capital Funding for Cultural and Recreational Facilities
42. Mineral Aggregate Resource Policy
43. Planning Guidelines for Group Homes
44. Recreational Second Home Areas

45. 1981 Guidelines for Municipal Bargaining
46. Municipal Boundary and Related Disputes
47. Public Housing in Ontario
48. The Ontario Heritage Act
49. Municipal Perspective on Housing Programs in the 1980's
50. Debt Management Powers and Practices for Ontario Municipalities
51. Submission to the Parliamentary Task Force on Federal-Provincial Fiscal Arrangements
52. Municipal Lot Levies
53. Provincial Incentives for Source Separation
54. Provincial-Municipal Funding for Children's Services
55. Assessment and Taxation of Farms and Managed Forests
56. The Future Role of Rail
57. Ontario Public Libraries Program Review
58. Recreation, Sport, and Fitness: A Response to the Fisher Report
59. Protection of Human Rights in Ontario: Employer-Employee Relations
60. 1982 Guidelines for Municipal Bargaining
61. Response to the Discussion Paper -- Continuing Education: The Third System
62. Housing Services for the Psychiatrically Impaired
63. Response to the Proposed Emergency Planning Legislation
64. Transportation of Dangerous Goods

82-1 Adult Residential Facilities
82-2 Response to Bill 159 - An Act to Revise the Planning Act
Appendix to "AMO Reports 82-2": Clause by Clause Review of Bill 159 - An Act to Revise the Planning Act ($4.00)
82-3 Property Taxation of Farms and Managed Forests
82-4 Response to the Provincial Discussion Paper on Wetland Policy
82-5 Provincial-Municipal Grants for Children's Services
82-6 Municipal Lot Levies: An Update
82-7 Rent Review in Ontario
82-8 Report of the Section 86 Working Group
82-9 Report on Amendments to the Police Act
82-10 Bill 115 - An Act to Amend the Retail Sales Tax Act
82-11 Bill 11 - An Act to Provide for the Licensing of Businesses by Municipalities
82-12 Report on Amendments to the Fire Departments Act
82-13 Response to Bill 139 - An Act Respecting the Protection of the Health of the Public
82-14 Response to the Housing Initiatives Contained in the 1982 Ontario Budget
82-15 Foster Care: Proposed Standards and Guidelines for Agencies Placing Children
82-16 Bill C-61 - The Young Offenders Act: Implications for Municipalities
82-17 Report on Procedures with Respect to the Election of the Warden of a County Government
82-18 Canadian Shield Disposal Sites and Nuclear Fuel Waste Management

Copies of all the reports in this series are available at $2.50 each, (except as noted) for postage and handling, prepaid, from: Publications Centre, Association of Municipalities of Ontario, 100 University Avenue, Suite 902, Toronto, Ontario, M5J 1V6. Please make cheques payable to the Association of Municipalities of Ontario.